



... for a brighter future

DOE-FEMP

Working with DOE Laboratories

Argonne Capabilities

***Presented at the Interagency Energy Management
Task Force Meeting
March 18, 2009***



U.S. Department
of Energy

UChicago ►
Argonne LLC

A U.S. Department of Energy laboratory
managed by UChicago Argonne, LLC

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Argonne Has a Long History Supporting Clients under Work-for-Others Arrangements on a Wide Variety of Strategic Issues

■ EPA

- Energy supply/demand, climate change, energy efficiency and macro-economic studies



■ DoD (Army, DIA, DTRA, Navy, Joint Staff, USTranscom)

- Reliability of energy supply
- Energy disruption analysis
- Logistics analysis

■ DHS

- Infrastructure analysis, risk analysis

■ Department of Interior, Bureau of Reclamation, Minerals Management Service

- Optimized facility operations
- environmental assessments



■ State and local jurisdictions

- Strategic/comprehensive energy planning, emergency planning, financial project evaluations



■ DOT, DOS, NASA, NRC, USDA

Argonne Has a Long History Supporting Clients under Work-for-Others Arrangements on a Wide Variety of Strategic Issues

- Western Area Power Administration (several offices)
 - Power market studies, power price forecasting, optimized operations of generation facilities
- Private sector clients (e.g., utilities, investor consortia, consumer products)
 - Electricity price forecasting, risk analysis
 - Energy investment analysis
 - Supply chain analysis
- USAID, World Bank and other international lending agencies
 - Economic/financial evaluations of energy investment opportunities
 - *Small and large-scale power generation technologies*
 - *Renewable energy projects*
 - *Environmental control technologies*
 - *Energy conservation investments,*



FICHTNER



PRICEWATERHOUSECOOPERS PwC

P&G



USAID
FROM THE AMERICAN PEOPLE



European Bank
for Reconstruction and Development

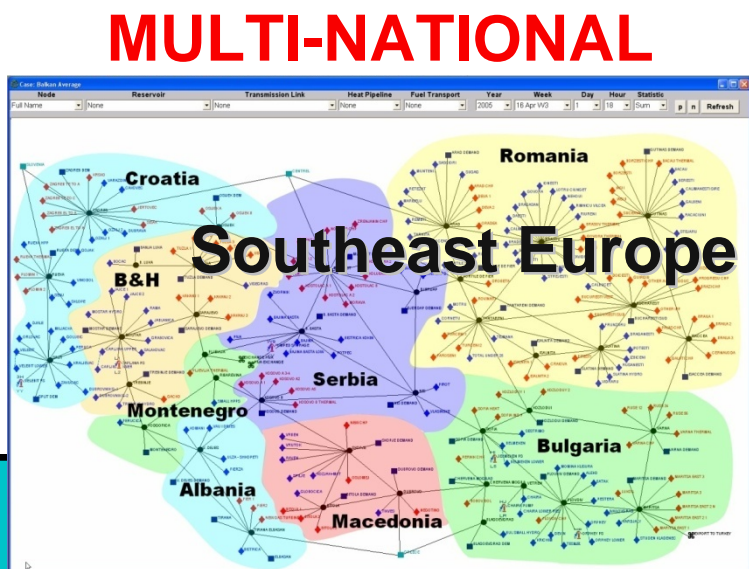
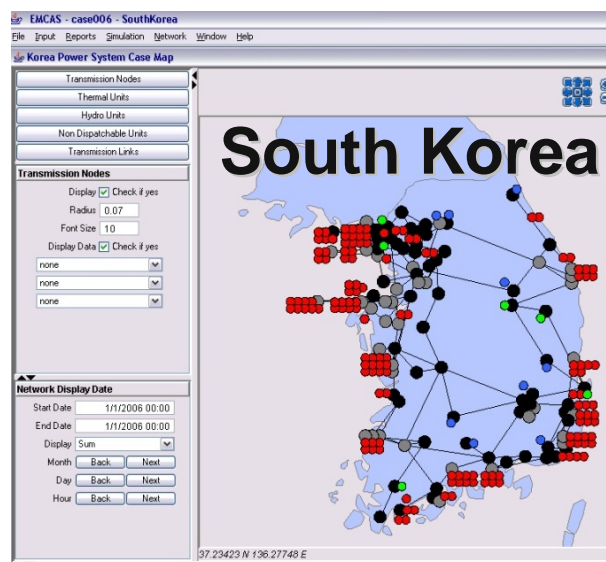
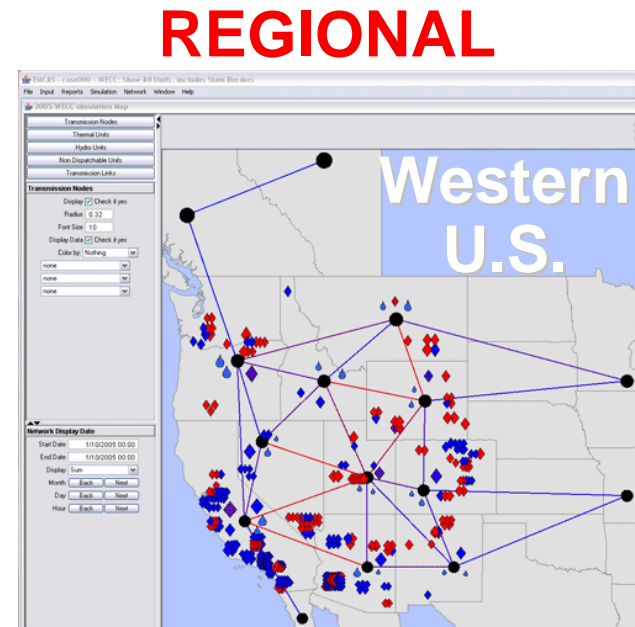
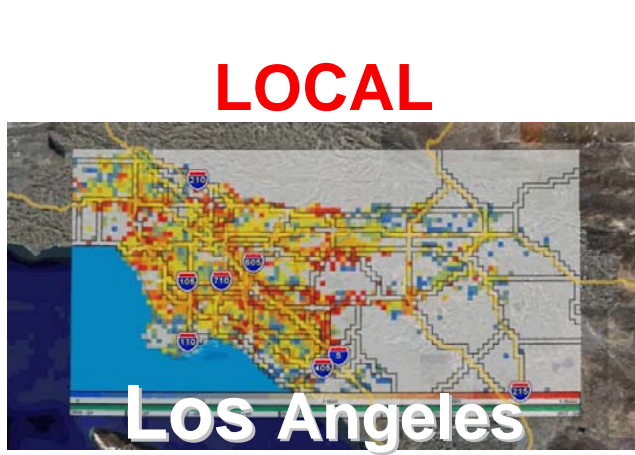
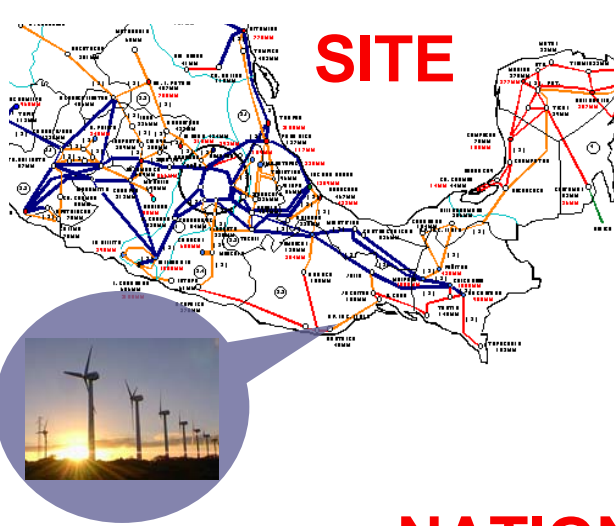


AFRICAN DEVELOPMENT
BANK GROUP



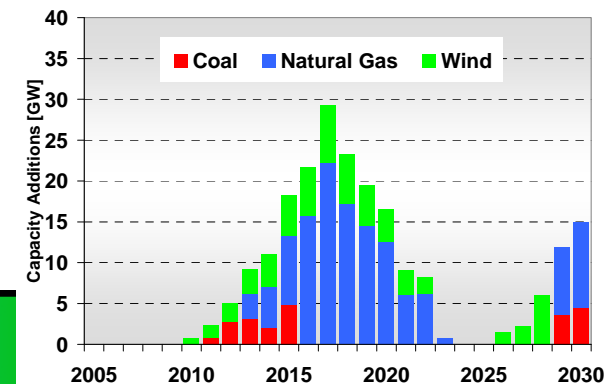
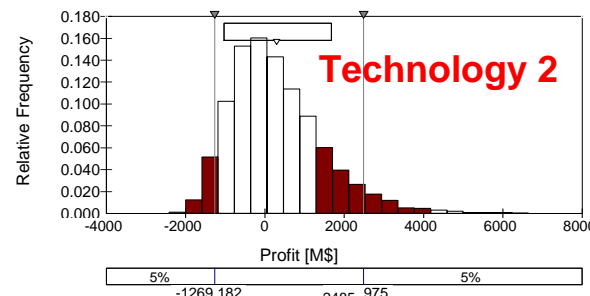
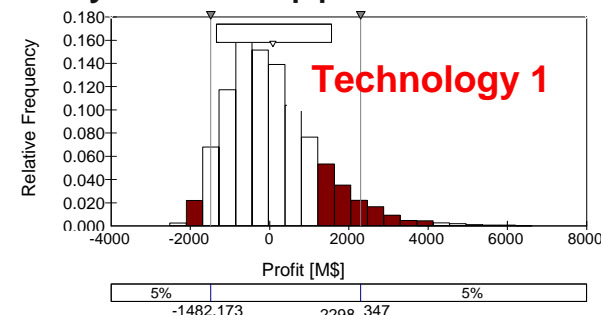
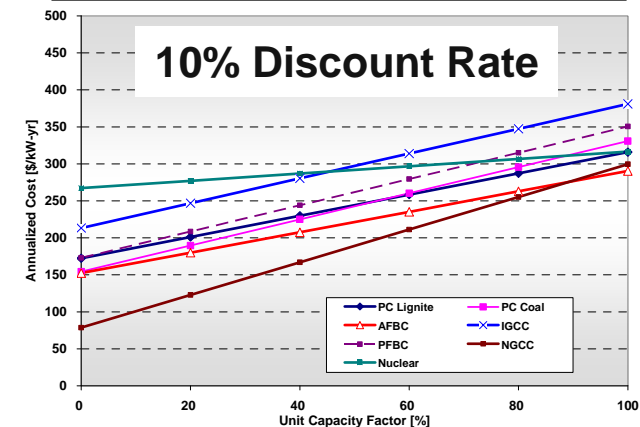
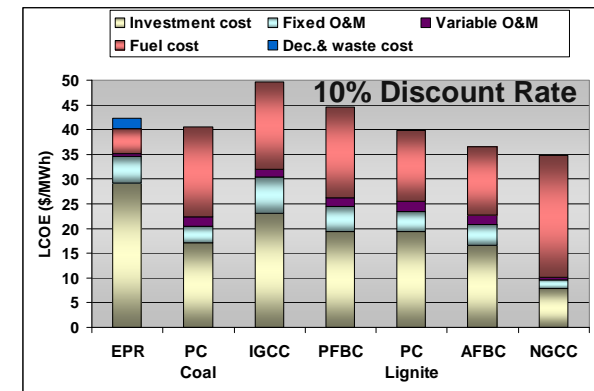
THE WORLD BANK

The Geographical Scope/Resolution of our Project Evaluation Studies Varies Depending on Client Needs and Specific Situations



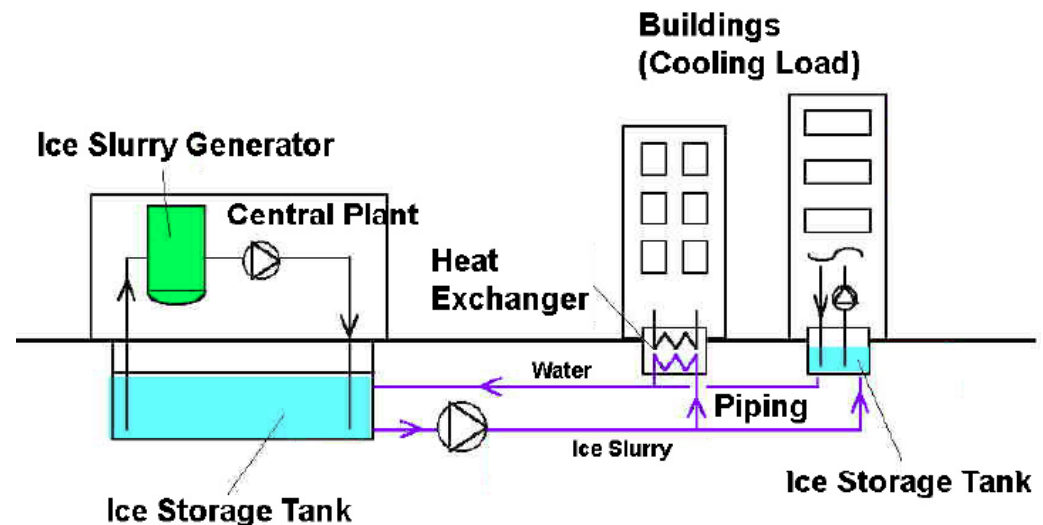
We Use Various Cost and Advanced Finance Economics Models to Evaluate and Compare Different Technologies

- We use cost engineering and basic economic calculations to determine life-cycle/levelized cost calculations to help our clients determine the basic competitiveness of different investment options
- We use real options analysis with explicit treatment of uncertainties for clients that want to focus on profits (rather than costs only) and risks
 - Computes expected profit and profit distributions
 - Various options can be valued (invest now, invest later, staged or modular investments, abandon project, uprate project, etc.)
- We use advanced modeling tools (e.g., stochastic dynamic programming, portfolio analysis) if a systemic approach is needed



Argonne is Working on New Site-Wide (District) Cooling Technologies

- Promising site-wide cooling concept which is more energy efficient and yields operational and equipment cost reductions over current large individual chilled water systems
- Controls and operations for space cooling, district cooling, and load shifting
- Optimized ice generator design
- Optimized slurry ice particle conditioning to achieve highly loaded, storable, and pumpable slurry
- Applicable to federal facilities, installations, bases, campus applications and private sector



Argonne's Unique Facilities Coupled with a Depth of Expertise in Basic Science and Applied Engineering Pushes the Frontiers of Transportation Research



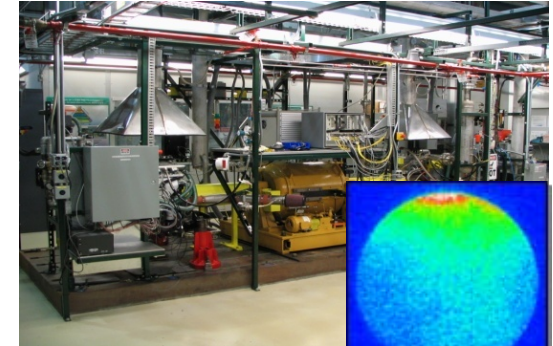
Transportation Hutch

APS – x-rays



Materials Research

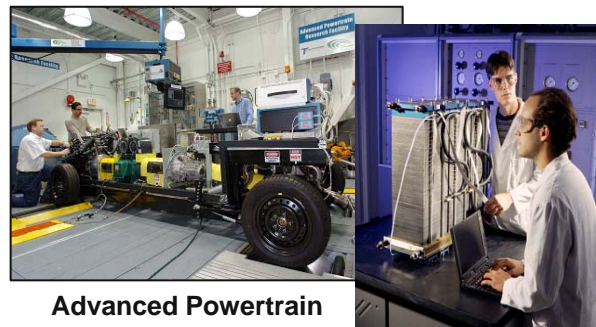
- Battery electrodes
- Fuel cell catalysts
- Tribology



**Basic and Applied
Combustion Research**



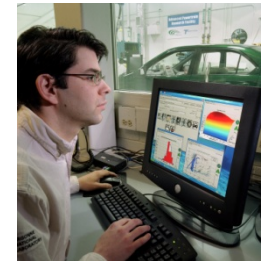
**End of Life
Vehicle Recycling**



**Advanced Powertrain
Research Facility**

**Fuel Cell and
Battery Testing**

Testing and Validation



**PSAT
GREET**

Modeling and Simulation



**High Performance
Computing**

Argonne Has the Largest Fleet of Alternative-Fueled Vehicles Among DOE Facilities

- Top of the line data collection system for the use of those vehicles
- Idle reduction project that has benefits for government agencies and private company fleets



Argonne's Transportation Research Attracts the Attention of the Energy Secretaries



Federico Peña powers up the EMD locomotive engine at ANL



Spencer Abraham learns about ANL's fuel cell reformer



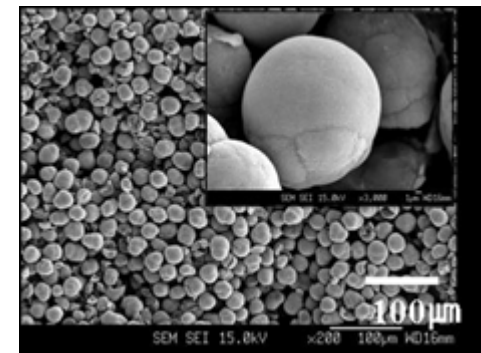
Bill Richardson celebrates 25 years of Argonne transportation research



Sam Bodman is introduced to ANL's fuel spray research

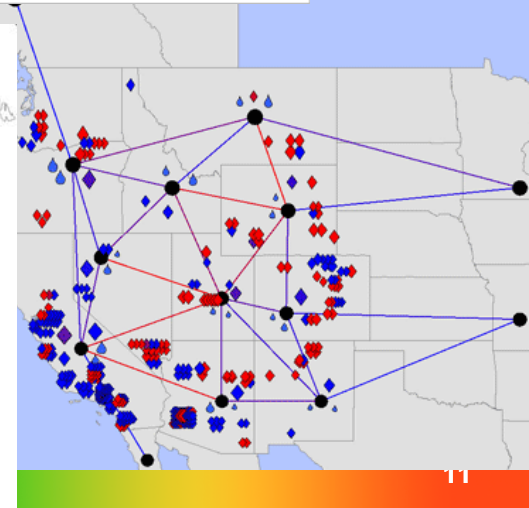
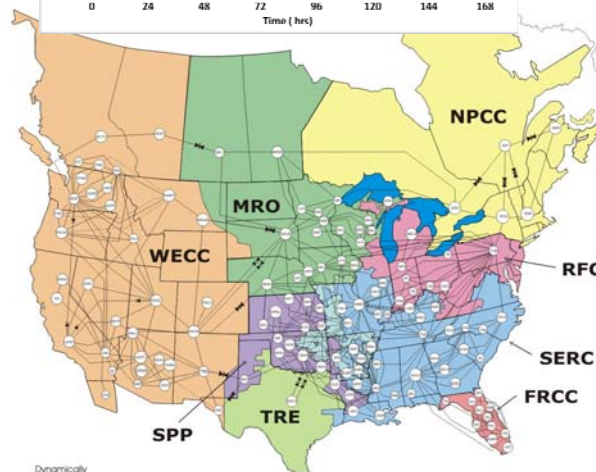
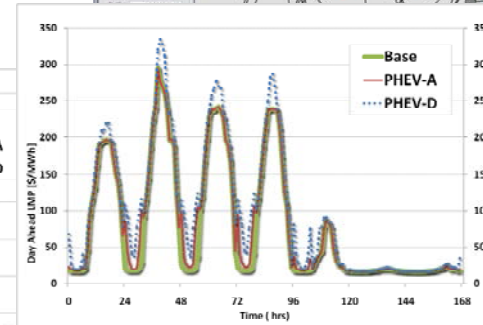
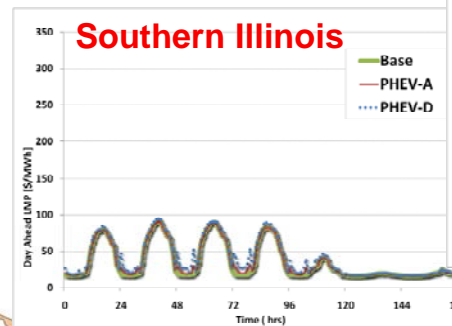
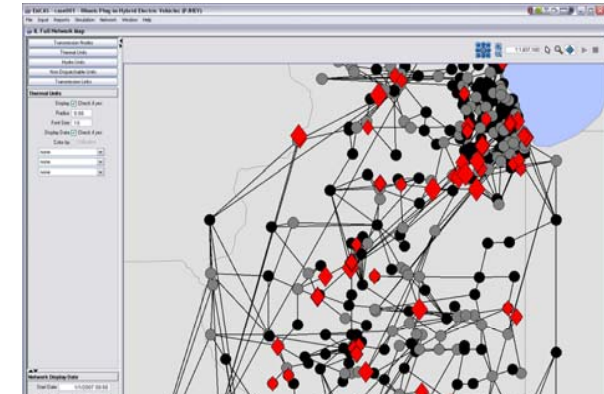
Argonne is Developing Transformational Energy Storage Systems that Enable and Enhance EVs, Renewables, and Smart-Grid

- Advancing electrochemical storage beyond lithium-ion batteries to ultra-capacitors and new material discoveries
- Developing energy storage prototype, manufacturing, and recycling processes and technologies
- Developing large energy storage & power management systems that improve grid reliability and efficiency, and enable steady power supply from renewable sources
- Optimizing efficiency, performance, and emissions of electric-drive powertrains



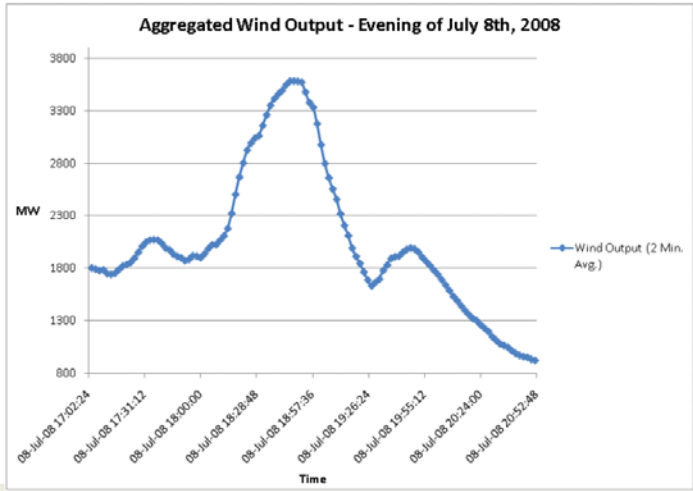
Argonne is Analyzing Grid Integration Issues of Plug-in Hybrid Electric Vehicles

- For DOE's Vehicle Technologies Program and H2 Program
- Total of 3 case studies
 - Different levels of detail
 - *Bus-level analysis for Illinois*
 - *Zonal (Balancing Authority) analysis for WECC*
 - *Regional analysis for Eastern Interconnect*
- With continued funding in FY10, eventual goal will be to develop detailed analysis for all of U.S.
 - Control area level
 - Bus-level for certain regions
 - e.g., NYISO, NEISO
- Future extension to capture V2G and storage of renewables

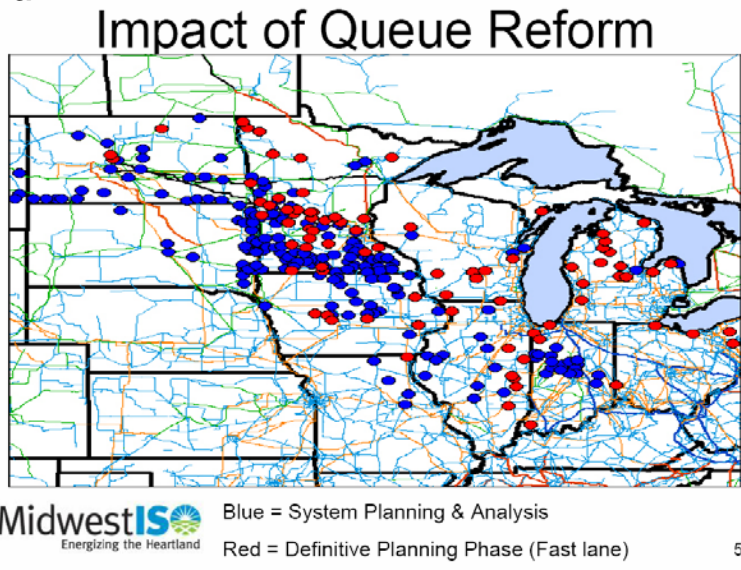
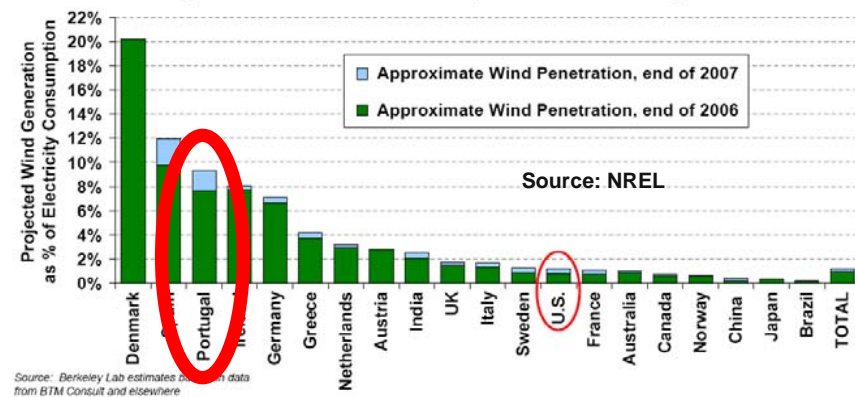


Argonne is Supporting DOE's Wind and Hydropower Program in Wind Forecasting and Integration

- New multi-year project on improved wind power forecasting and integration of wind power into system operations
- Argonne is leading an international team of experts
 - INESC-Porto (research institute from Portugal)
 - Horizon Wind Energy (third-largest wind producer in the U.S.)
 - Midwest Independent System Operator (MISO)
 - *Has currently 76 GW in queue incl. 61 GW wind*
- Forecasting and integration issues for wind and solar are related

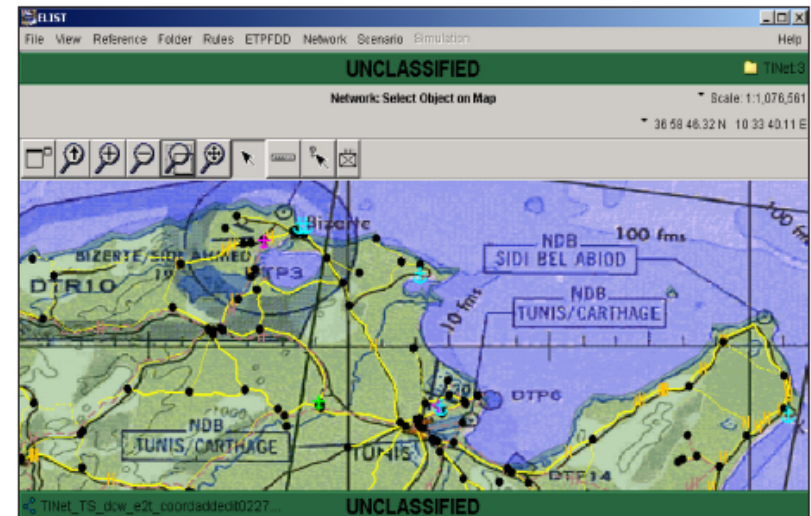
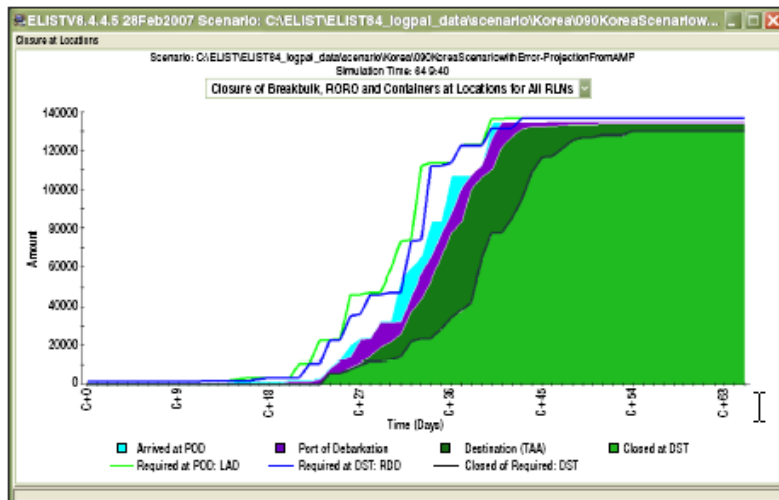


U.S Lagging Other Countries in Wind As a Percentage of Electricity Consumption



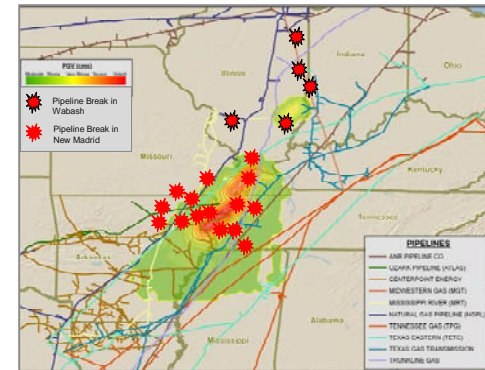
Argonne is Supporting DoD and Armed Forces in Logistics and Supply Chain Analysis

- Argonne has developed the Enhanced Logistics Intra-theater Support Tool (ELIST)
- ELIST is a DOD transportation forecasting simulation tool that models the movements of troops, equipment, and cargo
- ELIST simulates movements over a detailed model of the infrastructure with constrained transportation assets
 - Uses GIS infrastructure that represents roads, rail lines, waterways, airports, and seaports
- Model can be extended to analyze and optimize energy use for operations and study impact of alternative fuel use targets



Argonne is Supporting DHS and Other Agencies in Energy Supply Reliability, Disruption, and Restoration Analysis

- NGFast and other tools for natural gas supply disruption analysis
 - NGFast conducts pipeline break simulation and assessment of downstream impacts
- Looks at available emergency mitigation measures
 - Selectively shed interruptible loads (e.g., power plants, industrial loads)
 - Increase withdrawal from UGS
 - Increase flow from spare capacity from interconnected but unaffected pipelines
 - Withdraw LNG from storage
- Similar tools for oil and electricity
- Tools can be extended to analyze impact of on-site generation on site vulnerability/risk and determine value of on-site generation



Conclusion

- Argonne has extensive energy analysis capabilities that are relevant to other federal agencies
- Argonne transportation research center provides substantial capabilities and resources relevant to vehicles, fleet management, and transportation issues
- Argonne's tools are used world wide to analyze key strategic energy and electricity issues
- Argonne's tools and expertise can assist in accelerating and expanding the adoption of energy efficiency technologies and renewable technologies
- Argonne has extensive experience in WFO arrangements with federal agencies and other non-DOE clients